The experience of urban water recycling and the development of trust

June S. Marks

A thesis submitted in fulfilment of the requirements for the Degree of Doctor of Philosophy

Department of Sociology
Faculty of Social Sciences

The Flinders University of South Australia

13 June 2003

Table of Contents

Pages

Table of Contents

Pages

Table of Contents

Pages

Table of Contents

Pages

Tables

Table of Contents

Pages

Figures

Table of Contents

Appendices

Table of Contents

Synopsis

Water scarcity and water pollution are ongoing problems that require a rethinking of water use in the community. This calls for cooperation between the expert systems of water supply and sewerage as well as some level of public involvement. It is the interaction between the experts or providers, and the public as users or customers, that is the focus of this study on the experience of recycling water sourced from sewage effluent. This cross-national research explores the drivers behind water reuse; the way water reuse is presented to the public for consideration; the public response to water reuse; the influence of environmental and public health risk concerns; and the function of trust in the acceptance of potable water reuse and the sustainability of non potable reuse.

The absence of social science published literature relating to the experience of recycled water guided a grounded theory approach to this research, using a triangulation of methods for data collection and case study analysis. The social-psychological studies of Bruvold (1972-1988), located in water industry literature, were consulted to organise an audit of secondary, survey data obtained through industry contacts and fieldwork. In this way, acceptance of potable and non potable water reuse in the USA, UK and Australia is mapped to provide background data for a set of minor case studies that explore the experience of potable reuse.

Residential water reuse experience is investigated through embedded case study research. Primary data were collected at two residential sites in Adelaide and two in Florida. Recycled water is used for garden watering and toilet flushing at New Haven, and is planned for Mawson Lakes in Adelaide. Altamonte Springs and Brevard County in Florida recycle water for garden watering and outdoor uses only. Twenty residents were interviewed at each site involving semi-structured interviews: in-depth, face-to-face interviews in Adelaide and telephone interviews on site in Florida. Individual managers of the recycled water systems were also interviewed and, at New Haven, additional key stakeholders were consulted. Qualitative data analysis, employing a grounded theory approach, discovered the value of Sztompka's (1999) framework for the 'social becoming of trust'.

This research illustrates that the positive historical culture of trust at the Florida sites, coupled with robust structural support for residential water reuse that encourages positive provider-customer interactions, develops trust in non potable reuse and uses involving a higher level of contact. In the Adelaide sites, weak structural support induces reliance on informal structure that increases the public health risk, jeopardising the sustainability of residential reuse. In relation to potable reuse experience that centres on the Californian experience, a social dilemma is created through a strategic, marketing approach to public consultation and the lack of public communication on current water sources. Sztompka's (1999) framework for trust as an ongoing process is expanded to include principles of public participation that will further consolidate trust in water reuse to achieve sustainable outcomes.

Declaration

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

SIGNED:

....

June S. Marks

Acknowledgements

I am deeply indebted to my chief supervisor, Dr. Maria Zadoroznyj, Department of Sociology, Flinders University Adelaide, for her clear guidance and understanding. My sincere appreciation for the ongoing and enthusiastic support of Dr Darren Oemcke, United Water International Pty Ltd, and Dr Chris Bosher, Thames Water International. Special acknowledgement is also given to Dr Nancy Cromar, my co-supervisor, and Prof. Howard Fallowfield, both of the Department of Environmental Health, Flinders University Adelaide, where other Water Club members have provided peer group support over the past three years. Thank you also to Sian Hills for her support for this study and Prof. Jeni Colbourne at Thames Water Plc, UK, both of whom have taken an active interest in this research.

Flinders University of South Australia, United Water International Pty Ltd, Thames Water and Vivendi Water all made this research possible through a university-industry scholarship. Without financial backing from the industry partners, the seven-week long field work in the USA would not have eventuated.

Heartfelt appreciation is extended to two executive engineers in Florida: Tom Helgeson of the City of Altamonte Springs, and Dick Martens of Brevard County Water Resources who welcomed my research efforts and provided kind hospitality and every assistance. I am also grateful for the assistance of William Johnson, City of St Petersburg, and his staff. My thanks for encouragement and assistance to Dr. Dan Okun, Kenan Professor of Environmental Engineering, Emeritus, at the University of North Carolina, Chapel Hill; William Marcous, City of Sanford; Dr David York, Florida Department of Environmental Protection; Prof. Renu Khator, University of South Florida; and Dr Evelyn Torres, Upper Occoquan Sewage Authority. Special thanks to Dr Troy Hartley, Resolve Inc. for the invitation to the Washington symposium on public perceptions and participation in water reuse.

I am most grateful to all those in California who provided information, hospitality and guided tours: Gary Teagal of the City of Newport Beach; Mary-Anne Walsh, resident of Newport Beach; Bob Kenton, Santa Clara Valley Water District; and Keith Israel, Bob Holden and Brent Buche of Monterey Water Pollution Control Agency. Thank you to Karen Kubick of San Francisco Public Utilities Commission for her kind assistance. I acknowledge with thanks the assistance given by Earle Hartling, Sanitation Districts of Los Angeles County; Marilyn Smith and the operations team at Irvine Ranch Water District; Tom Dawes and the public relations team at Orange County Water District; Lora Steere, East Bay Municipal Utility District; Patricia Tennyson and Kristina Bentson of Katz & Associates, Inc.

With appreciation also to all those in the water reuse industry in Australia who have provided assistance and support, including Mehlika Kayaalp, Department of Human Services, Adelaide; Andrej Listowski of Sydney Olympic Park; Naomi Roseth and Glen Selberg of Sydney Water; Colin Earnshaw of the City of Wagga Wagga; Port Adelaide Enfield City Council and Delfin Management Services.

My immediate family has helped me through these busy years: thank you all for keeping well without much help from me. I appreciate your faith and cheerfulness Chantal; and thanks for the last minute technical editing Richard and Alexander.

Glossary of terms

$	All dollar amounts are in Australian dollars unless otherwise noted. The conversion rate used (August 2001): AU$1 = US$0.52.
ABS	Australian Bureau of Statistics
agricultural reuse	Applying non potable reclaimed water to irrigate market vegetables, food crops, orchards, vineyards. Methods of application may be stipulated for reclaimed water not treated to a tertiary standard, or to avoid contact with food eaten raw.
backflow prevention	Method or device stopping reclaimed water from flowing back into the potable water system.
beneficial reuse	Reclaimed water for usually non potable uses in preference to discharging effluent to the environment.
black water	Water sourced from sewage.
cross connection	Reclaimed water enters the potable water system due to a wrongly connected pipe or lack of backflow prevention device.
Cryptosporidium	*C. parvum* is a protozoan parasite causing intestinal illness. Infective oocysts are shed in faeces and infection can occur through ingestion of contaminated food or water. The organism is resistant to chlorine.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
direct potable reuse	Reclaimed water treated to drinking water standard and introduced directly into the drinking water supply distribution system.
effluent	Treated sewage.
EPA	Environmental Protection Authority (in Australia) and Environmental Protection Agency (USA)
event	Shortened term for an incident involving a failure in the water supply, sewerage or reclaimed water system.
FDEP	Florida Department of Environmental Protection
Giardia	Similar to *Cryptosporidium* but not as resistant to chlorine.
grey water	Water sourced from household laundry, shower, kitchen.
incident	Like an event, a failure in the water/sewerage service, or suspected failure such as water contamination.
indirect potable reuse	Reclaimed water treated to a minimum of secondary treatment level for percolation to groundwater or tertiary level for supplementing surface water catchments.
industrial reuse	Using reclaimed water for specified non potable uses, for example cooling towers in oil refineries.

Glossary of terms

micro filtration	Very fine filtration process having a pore size range 0.05 to 3.0 micrometres (1 micrometre=10^{-6} metres) and capable of direct filtration of bacteria, and some viruses, protein and enzymes. It is particularly effective in the removal of *Cryptosporidium* oocysts, *Giardia* cysts and parasites generally.
non potable	Water that should not be used for drinking, cooking, showering or bathing, or washing clothes.
non potable reuse	Using reclaimed water for uses such as garden irrigation that do not involve direct human ingestion. This excludes potable uses such as drinking, cooking, showering and laundry.
potable	Water that is supplied for drinking and all other uses.
potable reuse	Using reclaimed water for drinking and all other uses.
reclaimed water	Water sourced from sewage and treated to a standard compatible with intended use.
recycled water	As above: treated water sourced from sewage.
residential reuse	Using reclaimed water for non potable uses such as watering household gardens and flushing toilets.
RO	Reverse osmosis; a process that forces particles as fine as salt from water.
secondary treatment	Following primary treatment (water separated from gross pollutants) involving biological removal of contaminants.
sewage	Flushed toilet waste and other household and municipal wastewater.
sewerage	Sewage collection and treatment system.
sullage	Water sourced from household laundry, shower, kitchen.
Sydney water incident	Potentially fatal *Cryptosporidium* and *Giardia* were detected in the drinking water between 29 July and 19 September, 1998 when Sydney residents were notified to boil water on four separate occasions.
TDS	Total dissolved solids, the concentration of salt in a water sample.
tertiary treatment	The level reached after primary and secondary biological treatment of sewage involving filtration and disinfection.
unplanned potable reuse	Effluent discharged to surface or ground waters upstream of withdrawal of raw water to be treated for drinking water.
UV disinfection	Ultraviolet light treatment process.
water reuse	Using water sourced from sewage, unless otherwise indicated, e.g. grey water reuse.

CHAPTER ONE

Introduction

> All water has a perfect memory and is forever trying to get back to where it was.
>
> (Toni Morrison 1996)

The modern day water crisis of scarcity is one of the latest crises of modernity; a manifestation of ecological risk and growing urbanisation. Beck's (1989, 1992) emerging 'risk society' depicts such phenomena as a side-effect of modernity, one of the technologically induced risks of unbridled development. He further suggests that in addressing man-made hazards, risk society has a propensity to create more risks, leading to the further endangerment of future societies. This is one outcome of social reflexivity. However, it is acknowledged that reflexivity may result in reflection and cooperation between the physical and social sciences which lead to reforms that steer modernity through the current milieu (Beck 1994; Giddens 1994a). Does water reuse provide a viable, socially accepted solution to the current water crisis? This research investigates the sustainability of water reuse with respect to the social interactions and cultural influences that may bring about its acceptance or rejection.

Overview of this research

The social presentation, acceptance and user experience of recycling water for urban uses has been the focus of this cross-national research. In the absence of previous social science publications relating to water reuse experience, a triangulation of methods assisted in gaining deeper insight into this field. Following an initial review of the literature, work began with in-depth semi-structured interviews at New Haven, Adelaide, in July 2000 to capture the unique experience of residents at this site which was the only residential development in Australia where people had experience using recycled water in a purposefully built dual-pipe distribution system. The embedded case study design (Yin 1989) employed a grounded theory (Glaser & Strauss 1967, Glaser 2002) approach to data collection and analysis that recognised the usefulness of Sztompka's (1999) framework for 'the social becoming of trust' and Giddens' (1994b) concept of ‘active trust’ in analysing trust in technology in an emerging risk society (Beck 1992). The ethnographic research and audit of archival survey data together with this initial work informed the analysis of previous surveys and subsequent case study selection of sites in Adelaide and Florida, for non potable reuse, and in Australia and the USA, for potable reuse experience.

Water and ecological sustainability

The drive for water reuse stems from the discourse of ecologically sustainable development. A helpful description of just what this entails is eloquently portrayed by Rees (1997). The ‘ecological footprint’ demonstrates that unbridled urban growth creates entropic ‘black holes’. Populations in developed world cities live beyond the political boundaries they occupy through their extraction of resources from host ecospheres which are also the dumping ground for their waste. To address the imbalance, radical shifts in consumption patterns and regional self reliance rather than global interdependence are required which will necessarily involve government intervention. This definition unambiguously places the responsibility for sustainable development right at the feet of the social actors involved, whereas the more popular meaning given in the 1987 ‘Bruntland Report’ is less definitive, using the broad intergenerational justice issue of meeting "the needs of the present without compromising the ability of future generations to meet their own needs". Global inequalities are not suggested in this version and lie beyond the scope of this study. However, a global perspective on water scarcity provides a backdrop to national and regional perceptions of more local, urban water crises.

Urban water supplies are sourced from the technological interruption of the natural water cycle. Urbanisation of the world’s population, however, is increasing so that by 2025 it is predicted that five billion people, that is, 70%, will live in urban centres. The corresponding increase of urban dependence on agriculture is confounded by the more intense competition between urban and agricultural sectors for the same water resources (Postel 2001:34). There is no simple solution to developing water supplies. Damming rivers and streams destroys ecosystems and consumes land, causing disputes within communities and across borders (Gleick 2001:30). The practice of increasing or maintaining water imports into water scarce regions, such as central and southern California, is also threatened by competing demands on water resources and environmental protection. A prediction often quoted in the industry is that wars in this 21st Century will be fought over water, not oil (for example, Brown 2000:1). While escalating hostilities in the oil-rich middle-east tend to invalidate this forecast, Mesopotamia is the site of some of the earliest water wars and this region is one of five in the world, including the USA, where over-pumping of groundwater is acute (Ellwood 2000:18; Gleick 2001:29), resulting in land subsidence or seawater intrusion.

Further depletion of this finite resource is caused through rising salinity levels, as witnessed in the Murray-Darling Basin that affects four states in Australia. Here, lower water levels and/or saline effluent discharges contribute salt to these waterways that are already historically affected by naturally occurring salinity. Over-extraction of water and insufficient environmental flows also hampers the system's ability to flood embankments causing the death of vast tracts of river gums and other vegetation. The situation is becoming so desperate that one of its side-effects threatens Adelaide, South Australia's drinking water supply. It is predicted that within the next twenty years, 40% of Adelaide's drinking water source, which climbs to 90% during periods of drought, will exceed the 800 EC[1] threshold for drinking water quality (MDBC 1999:vi). In other words, Murray River water will be undrinkable and the publicity given to this crisis has resulted in a media-lead campaign to "Save the Murray".

The physical expansion of urban growth has more direct effects. Water reservoirs once sited in pristine environments are now placed under pressure by encroaching agricultural as well as urban development. Incidents of intestinal diseases caused by ingestion of water contaminated by protozoa cysts *Cryptosporidium parvum* and

[1] EC is the electrical conductivity of water. EC increases with the salt content (salinity) measured as total dissolved solids (TDS). The relationship between EC and TDS varies with the range of salts present. For river water, TDS in milligrams per litre (mg/L) = 0.64 x EC in micro Siemens per centimetre (µS/cm) generally to ± 10% accuracy. The Murray is usually 200-500 EC which rises as it moves through the Riverland. Salinity needs to be below 800 EC (approx. 500mg/L TDS) if the water is sourced for irrigation or drinking (MDBC 2000).

Giardia have frequently occurred in the USA with a serious outbreak resulting in 400,000 illnesses and 100 deaths in 1993 in Milwaukee, Wisconsin (Griffin 1998:367). Suspected contamination of the newly corporatised water supply in Sydney in 1998, referred to in the industry as 'the Sydney Water incident', involved a higher number of oocysts than that reported for the Milwaukee outbreak (Morgan et al 1999:81). However, there was no increase in the incidence of diarrhoeal illness over the period due to either the non viability of the oocysts or effective preventative action of boiling water and drinking bottled water.

Spiralling urban growth, with its increased water consumption, also affects the volume of sewage requiring treatment and disposal, creating another set of environmental and economic pressures. Water and sewerage utilities are faced with more stringent regulations for treating both drinking water and sewage in addition to the cost of capital infrastructure for increasing service capacity. Therefore, sustainable development is not just an ecological ideal, it is becoming a necessity. Clean water is promoted through World Water Day each year, institutionalised since the Rio Earth Summit in 1992. At this historical meeting, the global plan 'Agenda 21', in which Chapter 18 specifically addresses water issues, was adopted by 174 heads of state (Suzuki 1999:3; Rast 2000). In the USA and Australia, water reuse has evolved from its early function as a cheaper method of sewage effluent disposal, where it was applied to woodlots and sewage treatment plant acreage, to one that invokes its implied value as 'beneficial reuse':

> No higher quality water, unless there is a surplus of it, should be used for a purpose that can tolerate a lower grade.
>
> (United Nations Economic and Social Council 1958, quoted in Okun 1996:208)

Water recycling: Australia and the USA

The innovation of recycling water is not new to Australia. The Western Treatment Plant at Werribee has been disposing municipal effluent to land for over one hundred years (Dillon 2000:99). Okun (1996) reports that, initially, this type of application was more of a response to the higher cost of adhering to pollution controls and to be rid of the waste, rather than a recognition of the beneficial use of reclaimed water. Some of the earliest beneficial uses in the USA date from 1925 when the Grand Canyon village developed dual reticulation to conserve water to meet the demand from tourism and this has since been expanded (1960s) and upgraded (Garthe & Gilbert 1968; Okun 1996:210). USA industry recognised recycled water as a manufacturing input in 1942 when chlorinated effluent was supplied to Baltimore for steel-making (Okun 1996:210). In the 1970s, municipalities adopted dual reticulation in Irvine Ranch Water District, California and St Petersburg, Florida - site of the largest dual system in operation (Okun 1996:207).

Recent structural changes in the Australian water industry have accelerated the importance of water reuse. Australia's National Competition Policy was established through the Council of Australian Governments' ‘Hilmer Report’[2] (1993) and lead to the Water Reform Agenda for a competitive water industry so that water pricing reflects actual management costs. Dillon (2000) acknowledges that this has been instrumental in attracting private sector investment in water infrastructure. The new philosophy of ‘natural capitalism’ explains the intersection of water recycling with this development. Patterson (2000) observes that the economic motivator, rather than altruism, encourages industry to recycle waste to save on costs while earning income on the sale of the transformed product.

Along with government intervention, as recommended by Rees (1997), sustainable practice is being institutionalised within corporatisation. For example, Sydney Water is obliged "to reduce per capita water demand by 35 per cent" over the period between 1991 and 2011 and to eliminate dry weather discharges to waterways (Gregory 2000:35). And in South Australia, SA Water’s operations contractor, United Water International, is obliged to achieve water quality improvement goals, generation of exports, water efficiencies, and fulfil community service and environmental management obligations (SA Water Board 1999:4-5). Adelaide is now home to the

[2] Commonly referred to as the "Hilmer Report": Prof. Frederick Hilmer being the Chairman of the Independent Committee of Inquiry into national competition.

largest DAFF (dissolved air floatation filtration) plant in the southern hemisphere recycling 120 ML/day (megalitres; million litres) of Bolivar treated sewage for distribution to Virginia for market garden irrigation (SA Water Board 1999:4).

The most recent information to hand suggests that water reuse is playing an important role in expanding available water supplies while curbing unwanted effluent discharges. Australia recycles 368 ML/day; 31% to mining and 28% to agriculture.[3] California is considered a leader in water reuse, recycling 1359 ML/day[4] and establishing internationally recognised standards for reclaimed water quality in Title 22 regulations (1972, 1978). However, this research confirms that Florida is the world leader in residential reuse where reclaimed water is used for domestic purposes including garden irrigation and car washing, but where reuse for toilet flushing is not allowed. The state of Florida recycles 1981 ML/day,[5] of which 42% comprises reclaimed water that allows public access, compared to 26% in California where residential reuse is only now being introduced and where common-area irrigation for residential areas and municipal parks is preferred. Florida also has a higher incidence of groundwater recharge (replenishing groundwater not necessarily used for potable purposes) and industrial reuse, while California's recycling is concentrated in agricultural reuse (48%).

Regulatory framework

There are no federal regulations governing recycled water in the USA or Australia. However, a number of states in the USA have state regulations, including California and Florida. In Australia, the National Water Quality Management Strategy "Guidelines for Sewerage Systems: Use of Reclaimed Water" (2000), like the US EPA Guidelines, are intended to be interpreted in the light of local conditions which are more readily addressed by State Guidelines. The water may be heavily chlorinated because disinfection by-products such as trihalomethanes (THMs) that cause concern in drinking water are not an issue for non potable uses (Okun 1998:3). Guideline levels of pathogens (viruses, bacteria, protozoa) will cause no harm if the water is accidentally

[3] 1996-97 from Australian Bureau of Statistics 2000 Water Account.
[4] Office of Water Recycling, updated 2000.
[5] Florida Department of Environmental Protection 1999 Inventory.

ingested over a short period of time (Okun 1998:3). Limits are generally imposed on biochemical oxygen demand (BOD), total suspended solids (TSS), total or faecal coliform counts and turbidity (AWWA 1994:13).

Defining water reuse

Water reuse refers to a planned system of recycling water sourced from sewage and, for this study, the term is interchangeable with recycled water or reclaimed water, reflecting the variation in colloquialisms. Separating the disposal of sewage, municipal waste water including toilet waste, from the drawing of drinking water has been practised since John Snow's 1854 discovery of the link between cholera outbreaks and contaminated water supply. However, regulations for the treatment of sewage for its disposal only date from early last century, culminating in the USA Clean Water Act in 1972, about the same time as The Safe Drinking Water Act (1974) in the USA. Gradually, sewage has received higher treatment and, currently, a minimum of secondary treatment with a strong trend to tertiary treatment before discharge to surface waters is the general practice across developed countries.

Non potable reuse involves further treatment of sewage effluent before distribution through separate pipes for irrigation of municipal open spaces, agricultural crops, common areas in housing developments, domestic gardens and toilet flushing, commercial and industrial uses. An international standard colour of lilac or purple is used to identify recycled water pipes and fittings which are required to be appropriately labelled along with sign posting of public space irrigation. However, non potable reuse should not be confused with grey water use, or sullage. Grey water is sourced from wastewater excluding sewage solids and is suitable for on-site domestic treatment. Used water from laundries, bathrooms and sometimes kitchens is collected and filtered for reuse on gardens, and sometimes for toilet flushing, if this is permitted. The focus of this study is on recycled water sourced from reticulated sewerage systems.

Potable reuse has a less universally accepted definition. More advanced, tertiary treatment involving multiple barriers enables indirect potable reuse, where the reclaimed water is returned to the water cycle either upstream of a water reservoir, or injected or allowed to percolate into a groundwater source. It is indirect because it blends with the raw water and there is a time lag between its introduction into the water reservoir and its entry into the mains water distribution for the drinking water supply. Direct potable reuse involves still higher treatment to meet drinking water standards and is introduced directly into a drinking water distribution system for immediate consumption.

Thesis presentation

The community experience of urban water recycling is the focus of this study. The research includes both providers, users and wider stakeholders involved in recycling water sourced from sewage. Two situations are investigated: domestic use of recycled water for irrigating lawns, gardens, car washing and toilet flushing; and potable reuse involving the implementation of systems designed to recycle water for supplementing drinking water supplies. This thesis presents the findings from the triangulation of methods in a variety of forms. Descriptive accounts speak to the concepts illustrated and the voices of research participants verify the 'social mood' and 'collective capital' of the various communities involved. Basic statistical representations are used to summarise more lengthy, collective trends and comparisons, supported by more detailed work in the appendices.

The literature review in Chapter Two outlines relevant theory from the social sciences that relates to the environment, water and risk. The significant highlights of Beck's (1992) thesis frames the review. Chapter Three reports on the research design and triangulation of methods used to capture the experience of water recycling in a range of community sites, and the wider industry of water and sewerage service provision. An audit of industry survey research into the public acceptance of mainly potable reuse is presented in Chapter Four. A review of Bruvold's (1972-1988) research is compared to ten Californian surveys and eleven studies from Arizona, Tampa, San Antonio, the UK and Australia. Levels of acceptance of potable reuse and non potable reuse are reported and socio cultural influences explored to identify trends and improvements in the approach of survey research in this field. The marketing approach nullifies the value of some of these studies, with many being insufficiently analysed to test relationships between variables. The social dilemma of potable reuse is presented in Chapter Five. A series of case studies covering six established systems, six attempts of implementation and a potable reuse system due to go on line is supplemented by supplementary illustrations and comment. The emerging theory of Habermas's (1990) communicative action and Sztompka's (1990) framework also resonates with the findings in Chapter Four and are discussed in more detail in Chapter Nine.

Presentation and discussion of the findings from primary data collection at New Haven and Mawson Lakes in Adelaide, and Altamonte Springs and Brevard County, Florida, in Chapter Six outlines the foundational context for residential reuse. Historical conditions, environmental influences, the structural context, social mood and collective capital are detailed as background data that shapes agency explored further in the following two chapters. In Chapter Seven the experiential shapers of trust are investigated to determine environmental awareness and the salience of water issues, drinking water preferences, water conservation behaviour and attitudes. Experience of non potable reuse identifies the benefits of water recycling to research participants, awareness of risk and the strength of concern, if any, in using the water. Once this is established, acceptance of non potable reuse is confirmed and the role of informal supports in shaping trust and risk in residential reuse is discussed.

Chapter Eight builds on the previous two chapters to assess the level of trust in water reuse providers, and water and sewerage agencies, and to situate that trust in terms of previous survey results. A revised culture of trust is noted with respect to more favourable assessments of service provided by SA Water and/or United Water in Adelaide. Confirmed distrust partly reflects the historical conditions and recent negative experience at access points to the system. Finally, the level of trust in potable reuse compares the responses to the laundry and shower uses to those for cooking and drinking. Factors influencing agreement and disagreement are identified and looked at more closely for those who distrust water and sewerage providers, yet trust potable reuse. Throughout the three chapters, Sztompka's (1999) framework is confirmed as an explanatory tool and the value of Giddens' (1994b) active trust is confirmed. Chapter Nine reviews the main findings and identifies the interlinking themes that again confirm the grounded theory. A brief summary and overall conclusions are drawn in Chapter Ten with final comment on the relevance of these findings for water reuse policy.